Comments on the August 2006 Draft of the Upper Columbia Salmon Recovery Plan

January 29, 2007

Interior Columbia Technical Recovery Team

The IC-TRT has been asked to provide comments on the June draft of the Upper Columbia recovery plan for salmon and steelhead ESUs, published in the Federal Register. We provide here key opportunities for improving the plan, and specific responses to the IC-TRT's review questions for recovery plans. (Note that in the following document we use ESU to mean ESU or DPS interchangeably.) These comments provide scientific peer review of the plan and identify opportunities for strengthening the likelihood that the plan, if implemented, could result in viable ESUs.

Key Opportunities for Improving the Plan:

Overall, we find that the plan, if implemented, could substantially improve the status of listed Upper Columbia ESUs. Its strengths included using reach specific data, efforts to consider all four "Hs," and an excellent goal of removing all "high" risk factors for spatial structure and diversity. However, there are a number of opportunities to improve the plan:

- **A clear linkage from goals and objectives to criteria, current conditions, and actions is a very important improvement**. The logic leading to specific strategies and actions should explicitly incorporate the status of viability parameters for the populations and ESUs. For example, if the distribution of a population is not impaired (i.e. earns at "low" or "very low" risk rating), but high proportions of out-of-ESU hatchery fish on the spawning grounds yield high risk ratings, then actions aimed at improving spatial structure should receive a lower priority, while actions aimed at reducing the risk posed by out-of- ESU spawners should be highlighted.

- **Prioritization both within and between "Hs" is needed.** Currently, prioritization for habitat actions appears to be based on professional judgment, public input, and EDT. These may not be the most appropriate actions when all VSP parameters (abundance, productivity, spatial structure and diversity) are considered. Some of this issue may be addressed by incorporating the implementation appendix more explicitly into the main body of the document.

- **The treatment of uncertainty about the magnitude of the ESU and population response to elements of the plan could be improved with the inclusion of a robust adaptive management plan.** There is decidedly a great deal of uncertainty about the expected response to a wide variety of actions, including most of the actions in this plan. The uncertainty *per se* is reasonable – it is the current state of our understanding. However, that uncertainty should be appropriately acknowledged and addressed in the plan, preferably through an adaptive management program. The discussion of such a program should describe what it would entail, the kinds of responses (e.g. in fish population, climate, or management) that would lead to changes in the plan, and how it will be implemented.

- **The hatchery section should be expanded to treat several additional areas.** First, there are a variety of past and potential hatchery programs that have affected and may affect population status in the future. These should be considered in the description of population status, and in the planned strategies and actions to achieve goals. Second, there should be correspondence between hatchery goals (for ALL hatchery programs) and habitat capacity. Finally, there appears to be some circularity in the hatchery and harvest elements. Some hatchery programs appear to be placed to allow harvest, but harvest in some locations appears to be in place primarily to remove hatchery spawners from the spawning grounds. This last issue may be merely a matter of clarifying the purpose of the variety of actions.

As a last general note, the IC-TRT's viability criteria were not initially designed with re-classification as a potential use. However, the proposed classification criteria are consistent with the intent of the VSP criteria, and do identify conditions that are substantially better than that currently seen in most populations today. In this sense, they may be useful guidelines for reclassification of the ESU from endangered to threatened.

TRT Review Questions for Recovery Plans:

Here we provide responses to Review Questions for Recovery Plans

1. ***ESU and Population Level Viability***

a. Does the plan explicitly aim to achieve population, MPG and ESU viability? Does it explicitly address IC-TRT viability criteria at each of these levels?

Four issues in this plan are relevant to this plan's use of IC-TRT viability criteria:

(1) There are a two aspects of ESU viability and TRT criteria that are could be addressed more explicitly.

This plan could be improved by incorporating a statement about achieving ESU-level viability as described by the IC-TRT and by stating that updates and modifications of the plan in the future will review the incorporation of updated TRT viability criteria

One possible fix in the current plan is the addition of a brief paragraph describing ESU viability and how the joint population level goals meet (or do not meet) ESU viability criteria. The TRT has recently posted a memo describing MPG and ESU scenarios that are consistent with TRT viability criteria at the following website: (http://www.nwfsc.noaa.gov/trt/trt_viability.cfm). This memo would provide an easy starting point for describing the "roll-up" of populations to ESU viability.

In addition, the TRT proposed ESU-level criterion of 1% ext. risk in 2 populations. We recognize that a goal of 5% extinction risk in these populations is a large improvement over current conditions. However, some discussion of the choice to aim for 5% risk in all populations, and the increased risk that would result from that choice is warranted. Alternatively, there may be opportunities to use an adaptive program to target first the 5% risk level, and then lower risk levels as appropriate to reduce the overall ESU risk. The increased risk associated with not having at least one population at levels higher than minimally viable should also be discussed.

Similarly, the choice not to aim for a low risk rating in SS-D in any of the populations results in an ESU scenario where all the populations could be in the most risky "viable" box in Table 2.3 (pg 51). The TRT has suggested (following McElhany et al. 2000) that at least one population in every MPG reach a "highly viable" condition. It also laid out 2 scientific arguments for an increase in the number of populations reaching high viability in a "one-MPG" situation -- the presence of only one extant MPG (i.e. ESU-level diversity) and only 3 populations in the ESU (increasing demographic risk).

(2) No goal or plan for Crab Creek steelhead is identified.

We do recognize that TRT technical guidance on Crab Creek's population status came late. We will be happy to work with you on any technical issues so that the plan can include an appropriate approach to this population. Clearly, a number of issues exist, since the anadromous component is likely functionally extirpated. However, some investigation, monitoring and scoping activities may be important.

(3) Recovery objectives are identified but not linked to the population characteristics identifiable as impaired.

As a relatively simple example, the spring Chinook and steelhead recovery objective for spatial structure and diversity is:

> "Restore the distribution of naturally produce spring Chinook and steelhead to previously occupied areas where practical and conserve their genetic and phenotypic diversity"

As written, it suggests that current levels of diversity will be sufficient; however, conserving current levels of genetic diversity will result in continued homogenization

within the Upper Columbia populations. A goal more consistent with TRT goals might be "allow natural patterns of genetic and phenotypic diversity to be expressed." On the other extreme, spatial structure is not typically limiting for populations in the Upper Columbia, restoring its distribution may not need to be addressed as a priority. Most importantly here, the recovery objectives should be tied to specific elements of population status that are not at "low" or "very low" risk.

(4) Metrics for recovery goals are not entirely consistent with TRT metrics.

(a) Productivity. The measurement of productivity in the plan is slightly different than that of the TRT. While we believe that this measurement, coupled with sufficient abundance, may be reasonable, we suggest either that the authors of the plan and key members of the TRT sit down together to craft a paragraph that would describe the implications of this different metric in comparison with the TRT metrics, or that for simplicity, the board adopt the TRT metrics.

(b) Abundance.

(i) For abundance criteria, the time frames used are slightly different; the board has adopted a 12 year geometric mean, while the TRT uses a 10-year mean. This difference is probably negligible, and varies in a conservative (for population status) direction.

(ii) Abundance goals should describe how variability in that measure will be treated. While the authors recognize that variability in abundance makes the "minimum" abundance a greater risk as a target, they do not explain how they will deal with that variability.

(iii) The plan appears to include hatchery origin spawners in assessing abundance goals. Only natural-origin spawners should be included in abundance estimates.

(c) Spatial structure and diversity.

(i) The goal of addressing all "high" risk factors for SS/D is excellent. If the intent here is primarily to address the factors causing the impairment to SS/D (rather than to observe the SS/D criteria at moderate or better risk), some description of how much these factors would need to be addressed would be useful.

(ii) Criteria proposed for spatial structure are not exactly the same as those proposed by the TRT, but do appear that they would meet low risk levels. However, it is unclear what the time period over which occupancy would be measured. The TRT was careful in its definition of occupancy to ensure that a situation that included zero redds in a MSA during the last 5 years would not qualify as occupied.

b. Does the plan characterize the current status of populations, MPGs, and ESUs using TRT viability criteria?

The plan does characterize the current status of populations, but not of the MPG or ESU. A brief orienting summary at those levels would be useful (see also above).

All of the populations except Crab Creek are described. The plan would be improved with the addition of Crab Creek. In most of the population status descriptions, issues with diversity (particularly genetic), and proportion/duration of hatchery spawners are not sufficiently recognized. In fact, in most populations, the summary of the status assessments in the main body of the plan and the recovery objectives appear to suggest that spatial structure is a limiting issue. The fix is fairly easy (i.e. recognize the diversity issues), but there will be substantive work involved in the remainder of the plan, as these issues should be carried through the limiting factors, strategies and actions (see also below). For example, the current hatchery programs are described, however, there are no actions and timelines that show how the hatchery programs will be modified to be compliant with low risk for diversity. Finally, as an editorial suggestion, we recommend highlighting the abundance and productivity status before the spatial structure and diversity status.

Steelhead maps should be updated with new intrinsic potential analysis and delineations of major and minor spawning areas.

2. ***Framework Questions (applied across the plan as a whole)***

a. Cohesiveness – Is there a clearly articulated rationale linking action plan to population, MPG, and ESU objectives, limiting factors and threats?

Additional identifiable links need to be developed between the goals for the populations and ESU and the actions chosen. In particular, there appears to be little effort to use the current status to identify key limiting factors and actions that would address those limiting factors. For example, if the population has a very low productivity, even if it has high abundance, actions aimed at improving population-level productivity should be a priority. The need for this link is most apparent in the goals and actions for spatial structure and diversity criteria, where fairly severe diversity issues (e.g. genetic homogenization and a high proportion of hatchery spawners on the spawning grounds) are not identified, and the focus of stated goals (e.g. pg. 115, line 12) appears to be on non-limiting spatial structure factors. In addition, while the plan includes some mention of monitoring and evaluation with subsequent adaptive management, it is very minimal. A more robust and transparent adaptive management program will be extremely important to add to the plan (see also above).

b. Models and Analysis

- *Are one or more independent models or analyses used to assess fish response to recovery actions?*

- *What is the support for models and assessment conclusions – are the conclusions logical?*

The plan used EDT to evaluate fish population response to habitat conditions and AHA (an extension of EDT) to evaluate the combination of habitat and hatchery changes. The construct and underlying assumptions of neither model are well-described. The analytical support that was not described was embedded in the EDT model, but the plan did describe assumptions and limitations of the model inputs and outputs in Appendix F1. The plan did describe the uncertainty in each step of the application of EDT, but not in the underlying model algorithms that link habitat conditions to life stage specific survival. The lack of independent models, and lack of model description make these challenging to evaluate; results from these models should be treated as hypotheses, with a robust adaptive management program formulated to deal with the uncertainty in these results.

c. Population Specific Data - use of empirical data from the target population. Is lack of specific data treated appropriately?

Population-specific data are used for the populations when available. In some locations, reach specific data were used. This is a strength of the plan.

However, the plan does appear to imply that the independent populations designated by the TRT may be too small (pg. 105, section 3.12.7). There is a possibility that the TRT may have erred in its population designation, particularly given the genetic evidence that is currently available from these populations. However, the Wenatchee chinook population is currently the second-largest population designated in the entire interior Columbia basin. It is at least as likely that there was historically multiple independent population structure within the Wenatchee (White/Little Wenatchee) and the Methow (Twisp). The current inability to detect differences between populations in the Upper Columbia is much more likely due to the Grand Coulee Fish Management Project mixing in the 1940s than to historic natural demographic mixing.

d. Empirical support – Is there empirical evidence that the proposed actions will have the desired effect relative to existing environmental conditions?

Unfortunately for all conservation planners, there is a great need for empirical evidence linking restoration and conservation actions to environmental and fish population response. The planners have presented actions and strategies that are currently thought to be important for improving salmonid population status.

e. Does the plan cite examples of responses to actions consistent with plan expectations?

No.

f. Does the plan present an integrated strategy at the population level, the MPG or ESU level?

The plan does present a comprehensive list of threats (pg. 98, section 3.11), and it does address all four of the "Hs". However, as above, threats are not tied explicitly in the plan to impairments in population status and associated actions. In addition, linkages between elements or Hs are not well-described.

3. ***Tributary Habitat Element***

a. Did the analysis use one or multiple independent models to understand potential fish responses to habitat improvement strategies? What is the nature of the analytical support linking population status to changes in habitat forming processes and local conditions?

The Upper Columbia plan used a single model (EDT) to quantitatively evaluate potential fish responses to habitat improvements. The application of this model relied on previous efforts to qualitatively describe limiting factors and habitat improvement strategies and priorities (RTT biological strategy, sub basin plans, 2514 watershed plans, and WCC limiting factors assessments). The analytical support is vague because it is embedded in the EDT model, but the plan did attempt to describe assumptions and limitations of the model inputs and outputs in appendix F1. The plan did describe the uncertainty in each step of the EDT process, but it did not roll up stepwise uncertainty into a set of conclusions regarding the legitimacy of the final output. Therefore, it is impossible to ascertain the accuracy of the model predictions. Importantly, EDT does not link specific actions to specific population responses (it links only the habitat conditions to population responses).

The list of actions may address primary limiting factors, however, there was no effort to link the implementation schedule to the modeling effort. The habitat section could be strengthened substantially by referencing, or summarizing Appendix M (implementation schedule). In an ideal world, this list of what the planners think will actually hit the ground in the next 10 years should have been modeled (in EDT or other assessment tool) to determine the expected results. However, this world is not ideal, and we recognize the time and effort constraints between the completion of the Implementation Schedule and the finalization of the document. In lieu of the modeling, a discussion regarding the

relative relationship between the Implementation Schedule and the 2 scenarios from the EDT modeling would be very useful. However, the predicted outcomes from implementing habitat restoration and protection were relatively large and the plan committed to habitat improvements that are predicted to produce species responses at least as effective as Scenario 3 (increases of 3-33% for productivity and 9-64% for abundance, depending on the population). Scenario 3 is assumed to leave options for watershed groups to reduce intensity of some habitat actions based on feasibility; but provides no analysis regarding the certainty that the 33% effectiveness scenario is feasible and leaves it up to local watershed groups to implement these actions. It is also unclear how the spatial-temporal scale of proposed actions matches protection-restoration of habitats needed for primary life history strategies, perhaps associated with the qualitative RTT biological strategy. These should be general descriptions of the important spawning and rearing areas, life history strategies (i.e. % fall migrants from MSAs to tributary mainstem) for each species, and known survival rates (egg to fry, fry to parr, parr to smolt) with documentation (agency reports.) Work conducted at the NWFSC for the 2004 BiOp Remand could also be brought to bear on this issue.

b. How well supported are hypotheses/assumptions for 1) VSP related factors most limiting recovery and 2) habitat forming processes and conditions that are limiting population response?

The plan did a reasonable job of laying out current status for the 4 VSP parameters and identifying which VSP attributes were most limiting recovery in habitat (but see also response to questions in section 2). Although variance was not included in the estimates of abundance and productivity, the populations were not close to meeting the minimum thresholds of the viability curve and the plan did recognize that uncertainty would need to be incorporated as the populations neared recovery levels. However, in general, better characterization of spatial structure and diversity that is consistent with the current status assessment in Appendix B would be useful (particularly for diversity issues)

The plan did provide their assumptions about how habitat recovery actions would improve conditions, but it did not attempt to justify all the hypotheses. Twelve action classes were applied to (up to) 46 environmental attributes in dozens of assessment units across the ESU. The daunting task of justifying each of the thousands of decisions was not attempted in this plan. The plan made a simple set of assumptions about how habitat restoration actions would change the environmental attributes that drive the survival relationships in EDT (i.e. effectiveness ratings). This set of "hypotheses" was documented in Appendix F2 and some summary information about the assumptions was provided in Appendix F1, but no justification or validation of the assumptions was attempted. Qualitative descriptions of habitat conditions and how they negatively (or positively) affect population parameters would be very useful.

c. Does the plan describe a habitat recovery strategy? If so, is the recovery strategy consistent with recovery hypotheses linking population status, key limiting habitat factors and threats?

Chapter 5 is titled "Strategy for Recovery", however, an outline or description of a specific strategy in the overview and the habitat section would be helpful. Although the plan failed to precisely articulate its habitat strategy, the anticipated process described in the plan, appears to allow local watershed groups to select actions for implementation from the lists of action classes within each assessment unit (Pg 196, line 14). A method of selecting projects was described (Fig 8.3; App. L), which includes project prioritization based on biological benefit, cost, and feasibility. This is a good method for prioritizing a specific set of projects that has already been developed and proposed. However, the plan needs a strategy that addresses the most important and efficient projects for recovery with some certainty (projects that directly address limiting factors). Importantly, identifying those VSP parameters for which the populations are at relatively high risk provides an opportunity to develop a coherent strategy. Strategies would include actions or classes of actions that would improve the parameter (e.g. productivity), or would address a factor at relatively high risk (e.g. actions that would reduce the proportion of hatchery fish spawning in the population).

The section on habitat (5.5 habitat actions) included lists of short- and long-term objectives (Pg 191-192) that were not measurable or specific. These were more like strategies because they lack locations and a target. The objective should be tied to a particular measurable target for a habitat attribute or to a life-stage survival (egg to smolt survival/ smolts/redd) and the overarching goal is to achieve viability for productivity and abundance. Habitat actions that are targeted at achieving spatial structure (connectivity) and diversity should be tied to a different set of objectives which is to achieve low risk for SS-D metrics.

The actions included in section 5.5 were generally consistent with what had been identified as the limiting factors in each assessment unit and prioritized areas that were considered strongholds. Due probably to the lack of available information, there was no attempt to quantify what the set of actions meant in terms of achieving a viable population status; however, the plan could explicitly link degraded habitat conditions to VSP parameters that are not meeting viable thresholds. There was not a clear link between the EDT output and the lists of short term and long-term actions listed for each assessment unit in section 5.5.3.

d. Are the proposed actions in the plan consistent with target changes in habitat conditions? Are there empirical examples demonstrating the proposed actions are effective?

Although there were tables that showed the proposed changes to current conditions for each habitat attribute in each assessment unit (Tables F14&F15), the plan did not report what the goal was for the future desired condition of the environmental attributes that were affected by implementing the restoration classes. Due to the inherent difficulties of justifying the effectiveness of proposed actions, and in measuring the effect of the action on the survival of fish, the plan needs to recognize what the goals are for environmental attributes that are considered limiting (similar to the Lower Snake River Plan). This will allow for much easier measurement of success of the habitat plan, since species performance will continue to be heavily influenced by factors other than tributary habitat The plan did not provide empirical examples of demonstrated effectiveness. Although not readily available in the literature, some descriptions of past successes in implementing the proposed action classes would go a long way in establishing certainty that the actions can be successfully implemented in the Upper Columbia. Presumably, the proposed actions have all been successfully implemented in the recovery region so it should be relatively simple to describe several of those successes and explain why it is likely that similar results can be expected in the future.

e. Is the habitat recovery strategy consistent with recovery strategies in other Hs (habitat, harvest, hatcheries and hydropower)?; and

f. Does the habitat recovery strategy preclude other actions in any arena that may be desirable in the future?

(Note that we include ecosystem-level issues, such as competition, predation, etc. in this section.)

Overall, as described, the habitat recovery strategy is consistent with actions and strategies in other arenas. However, there are some general issues of inconsistency or incompleteness within the strategy and with other arenas that merit mention:

- No nutrient enhancement is offered for the Wenatchee River. Is there the intent to apply it? If not, is there the intent to establish control and study areas to determine effects?

- A long term objective of the habitat strategy is to "maintain connectivity through the range of the listed species where feasible and practical." It would be important to ensure that viability criteria continue to be met in the future, or that connectivity allowing them to be met is established.

- There should be some coordination between the habitat and hatchery elements to ensure that there is sufficient habitat capacity for increasing wild populations and planned artificially-propagated fish.

- Diversions and other irrigation features don't seem to be addressed.

- There is little or no discussion of non-indigenous species and their potential impacts.

- Important short-term actions might include some planning and scoping.

- Disease and predation conclusions not well-supported.

4. ***Harvest Element***

a. Was the harvest analysis based on one or many models? What was the level of analytical support for the model(s) used in the assessment?

Harvest impacts were presented by fishery, and relied on models developed by those who manage each fishery. Typically, these models are well-supported. This section could be made improved with the addition of a succinct summary of how much (total) harvest each population receives, and where that occurs. Presently, the discussion is very focused on within subbasin harvest.

b. Did the harvest assessment include population specific data on impact rates, selectivity, and other population-specific effects?

Yes, the harvest assessment did include population-specific data.

c. How responsive is the planned harvest strategy to year to year variations in population abundance and productivity?; and

d. How certain is the empirical support for the effectiveness of the proposed harvest actions?

Currently, many of the harvest actions appear to be goals (especially the long-term actions of increasing harvest). Establishing goals for harvest is perfectly compatible with recovery planning. However, this strategy could be improved with greater reference to actions that will be taken to achieve those goals. This is particularly important since the level of harvest envisioned will likely require a greater return to the sub-basin than the threshold (average) suggested by the TRT. More specificity in the actions, and a description of how it will affect the populations and ESUs would also improve this section.

e. Does the harvest plan include an assessment of the potential selective effects on population diversity?

The harvest discussion would be improved with an assessment of potential selective effects.

f. Is the harvest strategy incorporated into the plan consistent with the identified limiting factors and threats for the population, MPG and ESU?

g. Is the harvest recovery strategy consistent with recovery strategies in other Hs?

h. Does the harvest recovery strategy preclude other actions in any arena that may be desirable in the future?

Overall, the harvest strategies are reasonable (as long as the long-term goals of increased harvest are supported by increased productivity and abundance through other actions). However, there seems to be an apparent circularity between the harvest and hatchery strategies, with large numbers of hatchery fish being released to support harvest, and harvest being implemented to remove surplus hatchery fish. Clearer discussion of goals vs. actions, and better alignment of hatchery and harvest goals and strategies could reduce this issue.

Hatchery Element

a. How well supported is the understanding of the links between hatchery actions and population viability (VSP) characteristics used in the planning?

There is a good description of the past and ongoing hatchery practices in the Upper Columbia (section 5.3.1). In addition, some risk factors are discussed (section 5.3.2). We would like to see the plan treat the hatchery practices more explicitly, and deal with both in-basin and out-of-basin issues. In addition, the distribution of naturally produced fish is currently expressed as was provided in the QAR process. These are reasonable goals, but for consistency they could be expressed in terms of TRT "occupancy" in the next draft. Finally, we would strongly suggest that efforts be made to improve our understanding of the relationship between habitat capacity and hatchery objectives and programs. In particular, it will be important to gain certainty that there is sufficient capacity, given planned hatchery releases, to improve the status of the natural populations.

b. Does the plan incorporate a hatchery production recovery strategy? If so, is the recovery strategy consistent with identified limiting factors and threats?

The short and long term objectives described in the plan, when considered together, could be considered a strategy. Very helpful would be a concise, overarching statement of the overall strategy, followed by some details, allowing the reader to determine if the strategy is moving the programs towards low risk. Because many of the populations in the Upper Columbia are currently at risk with respect to spatial structure and diversity due to hatchery programs, linking this strategy to current population status will be key. Some specific areas that need additional fleshing out include:

- The use of local broodstocks "to the extent possible" should be couched in the context of TRT criteria. In what areas will it be key to use local broodstock?
- How and to what extent will straying from in-basin and out-of-basin stocks be addressed?
- The long-term intent of hatchery programs – will they be phased out as recovery is achieved? Will some be maintained for harvest, in a manner that's consistent with TRT criteria?
- The role of steelhead kelt re-conditioning in achieving recovery is unclear. Some description of how kelts might be used and their relative importance to the overall strategies and goals would be very useful.

c. How responsive is the planned hatchery production strategy to year to year variations in population abundance and productivity?

There do appear to be options for managing the proportion of hatchery fish on the spawning grounds by using weirs and dams (Tumwater, Chiwawa, Twisp, Wells, Dryden) as removal locations during years with over-escapement. However, there does not appear to be any feedback loop to adaptively manage the hatchery production strategy to respond to monitoring data related to the VSP parameters. We suggest that the planners include a brief statement about potential treatment of year to year variation

d. Is population specific data used to support the planned hatchery strategy?

All ongoing programs are described, and population specific stray and proportion hatchery spawner data are presented. This presentation could be improved by presenting a brief summary of their strategy and how it addresses the population-specific conditions. Interpretation of these population-specific conditions could be better presented, particularly with respect to straying and return rates from those programs.

e. Are there examples demonstrating the potential effectiveness of the planned hatchery actions?

As with habitat actions, few empirical studies demonstrating the effectiveness of hatchery actions have been conducted. As the strategy and actions are linked clearly to impairments to population spatial structure and diversity (and/or productivity and abundance), we suggest that studies examining the effectiveness of these actions also be implemented.

f. Is the hatchery recovery strategy consistent with recovery strategies in other Hs?

g. Does the hatchery recovery strategy preclude other actions in any arena that may be desirable in the future?

There are two areas in which the hatchery strategy could be made more consistent with other sectors. First, is there an anticipated response in the hatchery arena to improvements in survival due to habitat or hydropower changes? Since hatchery production is at least in part, a maintenance effort, some discussion of phasing out or ramping down production would be worthwhile. Second, as discussed above, the harvest and hatchery programs are highly inter-related, and more explicit linking of the two would be very helpful.

In addition, there are a number of areas within the hatchery strategy that would benefit from some additional fleshing out:

- The potential impacts or benefits of the coho reintroduction plan to listed salmonids.

- The use of artificially propagated fish to seed unused accessible habitats – under what conditions would this be or not be appropriate?

- Steelhead hatchery programs and changes (past and future).

- The impacts of out-of-ESU fish or out-of-population fish on populations in the U. Columbia ESU

- Potential for hatchery programs (past, present and future) to exert selection on U. Columbia populations.

- Based on dam counts and radio tracking studies referred to in the draft, steelhead escapements to natural spawning areas have included extremely high proportions of hatchery fish for more than two decades. Until recently, the broodstock used in hatchery programs producing those returns was managed to maximize returns from artificial production, not for natural production characteristics. While the plan includes general objectives to ensure hatchery programs are consistent with recovery and to manage hatcheries to achieve sufficient natural productivity and diversity, it would be substantially improved by including or advocating a specific strategy for evaluating the potential for increasing natural productivity of steelhead through reductions in hatchery influences.

6. ***Hydropower Elements***

a. How well supported is the understanding of the links between hydropower impacts and population viability (VSP) characteristics used in the planning?

b. Does the plan incorporate a hydropower recovery strategy? If so, is the recovery strategy consistent with hypotheses linking population status, limiting factors and threats?

c. How responsive is the planned hydropower strategy to year to year variations in population status?

d. Is population specific data used to support the planned hydropower strategy?

e. Are there examples demonstrating the potential effectiveness of the planned hydropower actions?

f. Is the hydropower recovery strategy consistent with recovery strategies in other Hs?

g. Does the hydropower recovery strategy preclude other actions in any arena that may be desirable in the future?

The hydropower element was treated (not inappropriately) almost entirely in the context of the FCRPS Remand process and the HCP for the Mid-Columbia PUDs. At some point, the recovery planning process would benefit with a better, more integrated prediction of impacts, particularly with respect to year-to-year variation. Currently, the treatment could be improved by including some consideration of plume and/or estuary factors.

7. ***Monitoring, evaluation and adaptive management***

a. How well does the proposed monitoring and evaluation program address identified areas of uncertainty?

b. Are specific "check-ins" identified, either in time, or at the acquisition of particular "endpoints"?

c. Is there a mechanism to incorporate the results of monitoring into future management decisions?

The plan clearly identifies research, monitoring, evaluation and an adaptive approach to management as a key element of the plan. However, very little detail is provided in this plan. We understand that a separate R, M and E plan is being developed. We look forward to receiving this plan. We also suggest that key authors of and contributors to this plan and the R, M and E plan work together with members of the TRT to develop a

more robust approach to adaptive management, that lays out points (or characteristics of points) at which check-ins would be made, and the results of monitoring incorporated into future management decisions.

8. ***Consistency between recovery plans***

a. Are effects of similar recovery actions and predictions of population response consistent with those in other domains?

b. Do recovery plans treating species in the same domain incorporate effects of actions aimed at the other species? Do recovery plans incorporate actions aimed at other ESUs?

As one of the first recovery plans in the Interior Columbia, it is difficult to assess the consistency between plans. As a jointly written plan for the Upper Columbia, it does consider effects of actions aimed at other species, although this could be made more explicit. In addition, it would be worthwhile to examine the Lower Columbia recovery plan and incorporate and/or synthesize their treatment of estuary and plume conditions in this plan as well.

9. ***Integration***

a. Does the plan explicitly integrate recovery strategies or actions across the four Hs at the population, MPG and ESU levels?

The plan does explicitly integrate a variety of the strategies quantitatively using the AHA model, although there is little documentation provided, and the different sectors are treated with differential detail. At this point, the conclusions from the AHA modeling effort are reasonably logical and are more or less consistent with TRT status reviews. Importantly, the specific values that have been calculated are probably less robust than the qualitative conclusions from the model. In addition, the strategies will need to be integrated more explicitly for spatial structure and diversity.

b. Are estimates of the magnitude and rate of change at the population, MPG and ESU level in response to the recovery strategy robust?

There does not appear to be a basis for the estimated date of recovery (page 123). This may be derived from the AHA model, but it is not explained well.

c. Is the likely magnitude and rate of improvement consistent with the extinction risk of the population, MPG and ESU?

Given the magnitude of steelhead hatchery impacts, a more aggressive strategy in the hatchery arena may well be appropriate for this ESU.

d. Is the probable magnitude and rate of improvement from the proposed strategy likely to improve the status of the population, MPG and ESU? Is the magnitude of likely improvement consistent with achieving recovery in the long term?

The recovery planners have identified a set of limiting factors that affect salmonid population status and proposed a suite of strategies that will clearly improve conditions for listed ESUs in the Upper Columbia. Future climate and ocean conditions are likely to have an enormous impact on anadromous fish population status. Those future conditions and the effects of many of our conservation actions are uncertain. Thus, the most robust approach is one that includes an adaptive approach to decision-making and a strong monitoring component.

Specific comments:

Executive summary- see comments from the chapters and apply accordingly.

xviii Lines 10-15. This characterization is not quite accurate. The Entiat is a smaller population, but its high risk level is achieved by the combination of its intrinsic spatial structure and the result of human actions on its genetic signal and hatchery spawner proportion (and source).

xxiii Line 24-27. The grammar here is a bit awkward.

xxxiii Lines 12-27. Some indication of what the actions are would be extremely useful

Pg. 8. Lines 29-30. Unclear what "there is uncertainty about the genetics of Crab Creek steelhead" means.

Pg 23 Logic path did not include M&E and adaptive management, though the plan clearly does include these steps.

Pg. 26 lines 19-37. Distinguish between biomass and species richness

Pg. 29, lines 10-13, and 26-29 – Not an accurate depiction of TRT productivity statements. Also need to distinguish between observed population growth rate and intrinsic productivity.

Pg. 31, lines 28-32. Small tributaries of the Columbia are part of the Wenatchee population.

Current status assessment section filled with lots of numbers, but little interpretation. Also, need to update viability curves, maps, etc.

Section 3. It is unclear how harvest, hatcheries, management actions, etc. are not "Social, cultural and Economic factors. Might be worth defining these.

Pg 92, footnote. How do we know that bull trout recovery levels will not prevent the recovery of other listed species?

Pg 94, line 30. Fish condition in later life stages can be a factor of within-ESU conditions as well.

Pg. 98. Disease or predation – not well supported.

Chapter 4. Delisting Criteria – We suggest that the flow could be improved by including this section before chapter 2 on the species status. In addition, much of the information about the VSP parameters is discussed thoroughly in TRT documents and McElhany et al. 2000 – could reduce and cite those documents.

Pg. 139 lines 12-15. Do those fisheries have any impact on wild fish?

Pg 146. Line 1. Should this title specify "mainstem"? This section is confusing because it seems to skip back and forth between harvest opportunities in the mainstem on listed fish heading for their respective natal tributary and harvesting other spring Chinook not associated with a population between the Okanogan and Chief Joe Dam. This section is very redundant with previous sections and could be condensed considerably by only including one additional action that would allow some harvest in the mainstem if all UC populations were projected to reach their natural origin escapement goals.

Pg 171. line 20. "employ mechanisms". This action is a bit more specific, but more detail is still needed to understand the scope and magnitude. Why not list the current options for the mechanisms. For example, "Angling, removal at Tumwater Dam and Chiwawa weir, and other methods will be used to remove hatchery fish in excess of management objectives and will be provided to tribes, community food banks, or saved for nutrient supplementation." Then, be specific about what the management objectives are so that they can be evaluated with respect to their consistency with recovery.

Pg. 179, lines 19-20. In general ecosystem discussion (e.g. about predation, competition, etc.) are weak. These kinds of introduced species could also affect anadromous fishes.

Pg 191-192. Objectives are not measurable or specific. These are more like strategies because they lack locations and a target. The objective should be tied to a particular measurable target for a habitat attribute or to a life-stage survival (egg to smolt survival/ smolts/redd) and the overarching goal is to achieve viability for productivity and abundance.

Table 5.9 – a nice table, but missed some of the VSP parameters that could be affected in several cases.

AHA model appendices. There is insufficient information to review the applications of the AHA model attached as appendices to the July draft. In addition, the appendices labeled as model runs for Methow and Wenatchee spring chinook appear to be copies of model runs for steelhead populations. Modeling analyses used for recovery planning should include, at a minimum, clear descriptions of the intent of the modeling exercise, input data and key assumptions, and an evaluation of the results in the context of inputs, other modeling approaches and/or empirical data.

General organizational issues (repetitiveness, etc.), throughout the document.